Pushing the Envelope			
2006 Science			
Learning Standards			
District of Columbia Science			
Grade 5			
Activity/Lesson	**State**	**Standards**	
Types of Engines (pgs. 11-23)	DC	SCI.5.6.3	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Investigate and describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).
Physics and Math (pgs. 43-63)	DC	SCI.5.6.2	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Demonstrate that if the forces acting on an object are balanced so that the net force is zero, the object will remain at rest if it is initially at rest or will maintain a constant speed and direction if it is initially moving.
Physics and Math (pgs. 43-63)	DC	SCI.5.6.3	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Investigate and describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).
Physics and Math (pgs. 43-63)	DC	SCI.5.6.5	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Investigate and describe that the greater the net force, F, applied to a body, the greater its acceleration, a. Describe that the greater the mass, m, of an object, the smaller the acceleration produced by a given force.
Rocket Activity (pgs. 69-75)	DC	SCI.5.6.2	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Demonstrate that if the forces acting on an object are balanced so that the net force is zero, the object will remain at rest if it is initially at rest or will maintain a constant speed and direction if it is initially moving.
Rocket Activity (pgs. 69-75)	DC	SCI.5.6.3	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Investigate and describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).
Rocket Activity (pgs. 69-75)	DC	SCI.5.6.5	Unbalance forces cause changes in velocity. As a basis for understanding this concept, students: Investigate and describe that the greater the net force, F, applied to a body, the greater its acceleration, a. Describe that the greater the mass, m, of an object, the smaller the acceleration produced by a given force.

Pushing the Envelope			
2006 Science			
Learning Standards			
District of Columbia Science			
Grade 5 (New Grade 5)			
Activity/Lesson	**State**	**Standards**	
Types of Engines (pgs. 11-23)	DC	SCI.5.9.3	Students will be introduced to concepts of forces and motion. Students should be able to: Describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).
Types of Engines (pgs. 11-23)	DC	SCI.5.9.4	Students will be introduced to concepts of forces and motion. Students should be able to: Describe that, for an object moving in a straight line, acceleration, a, is the change in velocity, v, divided by the time, t, that change takes (a = v ÷ t).
Chemistry (pgs. 25-41)	DC	SCI.5.8.2	Students will be introduced to concepts of heat and energy: Students should be able to: Explain that many kinds of chemical changes occur faster at higher temperatures.
Physics and Math (pgs. 43-63)	DC	SCI.5.9.2	Students will be introduced to concepts of forces and motion. Students should be able to: Demonstrate that if the forces acting on an object are balanced so that the net force is zero, the object will remain at rest if it is initially at rest or will maintain a constant speed and direction if it is initially moving.
Physics and Math (pgs. 43-63)	DC	SCI.5.9.3	Students will be introduced to concepts of forces and motion. Students should be able to: Describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).
Physics and Math (pgs. 43-63)	DC	SCI.5.9.5	Students will be introduced to concepts of forces and motion. Students should be able to: Describe that the greater the net force, F, applied to a body, the greater its acceleration, a. Describe that the greater the mass, m, of an object, the smaller the acceleration produced by a given force.
Rocket Activity (pgs. 69-75)	DC	SCI.5.9.2	Students will be introduced to concepts of forces and motion. Students should be able to: Demonstrate that if the forces acting on an object are balanced so that the net force is zero, the object will remain at rest if it is initially at rest or will maintain a constant speed and direction if it is initially moving.
Rocket Activity (pgs. 69-75)	DC	SCI.5.9.3	Students will be introduced to concepts of forces and motion. Students should be able to: Describe that unbalanced forces cause changes in the speed and/or direction of motion of an object (acceleration).

Rocket Activity (pgs. 69-75)	DC	SCI.5.9.5	Students will be introduced to concepts of forces and motion. Students should be able to: Describe that the greater the net force, F, applied to a body, the greater its acceleration, a. Describe that the greater the mass, m, of an object, the smaller the acceleration produced by a given force.
Pushing the Envelope			
2006 Science			
Learning Standards			
District of Columbia Science			
Grade 8			
Activity/Lesson	**State**	**Standards**	
Types of Engines (pgs. 11-23)	DC	SCI.8.4.1	All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students: Demonstrate that the mass of an object is a measure of the quantity of matter it contains (measured in kg or g), and that its weight (measured in N) is the magnitude of the gravitational force exerted between Earth and that much mass.
Types of Engines (pgs. 11-23)	DC	SCI.8.7.3	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Explain why an unbalanced force acting on an object changes the object's speed or direction of motion or both.
Types of Engines (pgs. 11-23)	DC	SCI.8.7.5	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Know that the greater the mass of an object, the more force is needed to change its motion.
Chemistry (pgs. 25-41)	DC	SCI.8.2.8	Elements have distinct macroscopic properties and atomic structures. As a basis for understanding this concept, students: Describe how the atoms, molecules, or ions comprising an object are in constant individual motion, and explain how their average motional (kinetic) energy determines the temperature of the object, and how the strength of the forces between them determines the state of matter at that temperature.

Chemistry (pgs. 25-41)	DC	SCI.8.3.3	Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept, students: Explain how the idea of atoms, as proposed by John Dalton, explains the conservation of matter: In chemical reactions, the number of atoms stays the same no matter how they are arranged, and the mass of atoms does not change significantly in chemical reactions, so their total mass stays the same.
Chemistry (pgs. 25-41)	DC	SCI.8.4.1	All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students: Demonstrate that the mass of an object is a measure of the quantity of matter it contains (measured in kg or g), and that its weight (measured in N) is the magnitude of the gravitational force exerted between Earth and that much mass.
Physics and Math (pgs. 43-63)	DC	SCI.8.1.8	Scientific progress is made by asking questions and conducting careful investigations. As a basis for understanding this concept and to address the content in this grade, students should develop their own questions perform investigations. Students: Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, or temperatures, and choose appropriate units. Explain how to interpolate on analog scales.
Physics and Math (pgs. 43-63)	DC	SCI.8.7.1	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Recognize that a force has both magnitude and direction.
Physics and Math (pgs. 43-63)	DC	SCI.8.7.3	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Explain why an unbalanced force acting on an object changes the object's speed or direction of motion or both.
Physics and Math (pgs. 43-63)	DC	SCI.8.7.5	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Know that the greater the mass of an object, the more force is needed to change its motion.

Physics and Math (pgs. 43-63)	DC	SCI.8.7.6	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Explain that if the net force acting on an object always acts toward the same center as the object moves, the object's path is a curve about the force center. (Motion in a circular orbit is the simplest example of this concept.)
Rocket Activity (pgs. 69-75)	DC	SCI.8.7.1	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Recognize that a force has both magnitude and direction.
Rocket Activity (pgs. 69-75)	DC	SCI.8.7.3	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Explain why an unbalanced force acting on an object changes the object's speed or direction of motion or both.
Rocket Activity (pgs. 69-75)	DC	SCI.8.7.5	When an object is subject to two or more forces at once, the effective force is the cumulative effect of all the forces. As a basis for understanding this concept, students: Know that the greater the mass of an object, the more force is needed to change its motion.
Pushing the Envelope			
2006 Science			
Learning Standards			
District of Columbia Science			
Grade 8			
Activity/Lesson	**State**	**Standards**	
Chemistry (pgs. 25-41)	DC	SCI.8.2.4	Students at this level should be honing their skills in experimental design. Students should be able to: Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, or temperatures, and choose appropriate units. Explain how to interpolate on analog scales.
Chemistry (pgs. 25-41)	DC	SCI.8.3.4	Students at this level will be refining their understandings around concepts of structure of matter. Students should be able to: All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students:Know that density is mass per unit volume.

Chemistry (pgs. 25-41)	DC	SCI.8.7.2	Students will be introduced to the Law of Conservation of Mass and its application to understanding chemical and physical changes. Specifically students should be able to: Explain how the idea of atoms explains the conservation of matter: In chemical reactions, the number of atoms stays the same no matter how they are arranged, and the mass of atoms does not change significantly in chemical reactions, so their total mass stays the same.
Physics and Math (pgs. 43-63)	DC	SCI.8.11.1	Students will be introduced to the relationship between forces and motion. Students will also explore the mathematical relationships between forces and motion as well as the graphical representation of these relationships. Specifically students should be able to: Recognize that a force has both magnitude and direction.
Physics and Math (pgs. 43-63)	DC	SCI.8.11.2	Students will be introduced to the relationship between forces and motion. Students will also explore the mathematical relationships between forces and motion as well as the graphical representation of these relationships. Specifically students should be able to: Observe and explain that when the forces on a object are balanced (equal and opposite forces that add up to zero), the motion of the object does not change.
Physics and Math (pgs. 43-63)	DC	SCI.8.11.3	Students will be introduced to the relationship between forces and motion. Students will also explore the mathematical relationships between forces and motion as well as the graphical representation of these relationships. Specifically students should be able to: Explain why an unbalanced force acting on an object changes the object's speed or direction of motion or both.
Physics and Math (pgs. 43-63)	DC	SCI.8.11.4	Students will be introduced to the relationship between forces and motion. Students will also explore the mathematical relationships between forces and motion as well as the graphical representation of these relationships. Specifically students should be able to: Know that the greater the mass of an object, the more force is needed to change its motion.
Rocket Activity (pgs. 69-75)	DC	SCI.8.11.1	Students will be introduced to the relationship between forces and motion. Students will also explore the mathematical relationships between forces and motion as well as the graphical representation of these relationships. Specifically students should be able to: Recognize that a force has both magnitude and direction.

Rocket Activity (pgs. 69-75)	DC	SCI.8.11.4	Students will be introduced to the relationship between forces and motion. Students will also explore the mathematical relationships between forces and motion as well as the graphical representation of these relationships. Specifically students should be able to: Know that the greater the mass of an object, the more force is needed to change its motion.
Pushing the Envelope			
2006 Science			
Learning Standards			
District of Columbia Science			
Grades 9-12 (Physics)			
Activity/Lesson	**State**	**Standards**	
Types of Engines (pgs. 11-23)	DC	SCI.P.2.13	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Create and interpret graphs of speed versus time and the position and speed of an object undergoing constant acceleration.
Physics and Math (pgs. 43-63)	DC	SCI.P.2.1	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Explain that when the net force on an object is zero, no acceleration occurs; thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first law).
Physics and Math (pgs. 43-63)	DC	SCI.P.2.2	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Explain that only when a net force is applied to an object will its motion change; that is, it will accelerate according to Newton's second law, F = ma.
Physics and Math (pgs. 43-63)	DC	SCI.P.2.3	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: F1 on 2 = –F2 on 1 (Newton's third law).

Physics and Math (pgs. 43-63)	DC	SCI.P.2.4	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Explain that Newton's laws of motion are not universally applicable, but they provide very good approximations, unless an object is moving close to the speed of light, has a very large mass, or is small enough that quantum effects are important.
Physics and Math (pgs. 43-63)	DC	SCI.P.3.1	Recognize that when a net force, F, acts through a distance, delta x, on an object of mass, m, which is initially at rest, work, W = F delta x, is done on the object; the object acquires a velocity, v, and a kinetic energy, K = ½ mv2 = W = F delta x.
Physics and Math (pgs. 43-63)	DC	SCI.P.3.2	Describe how an unbalanced force, F, acting on an object over time, delta t, results in a change, delta p = F delta t, in the object's momentum.
Rocket Activity (pgs. 69-75)	DC	SCI.P.2.2	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Explain that only when a net force is applied to an object will its motion change; that is, it will accelerate according to Newton's second law, F = ma.
Rocket Activity (pgs. 69-75)	DC	SCI.P.2.3	Newton's laws of motion and gravitation describe and predict the motion of a vast variety of objects. As a basis for understanding this concept, students: Predict and explain how when one object exerts a force on a second object, the second object always exerts a force of equal magnitude but of opposite direction and force back on the first: F1 on 2 = –F2 on 1 (Newton's third law).
Rocket Activity (pgs. 69-75)	DC	SCI.P.3.1	The laws of conservation of energy and momentum provide independent approaches to predicting and describing the motion of objects. As a basis for understanding this concept, students: Recognize that when a net force, F, acts through a distance, delta x, on an object of mass, m, which is initially at rest, work, W = F delta x, is done on the object; the object acquires a velocity, v, and a kinetic energy, K = ½ mv2 = W = F delta x.